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ABSTRACT

A study was conducted to test the following four hypotheses: (1) more subject-area writing will produce better writing, (2) more subject-area writing will reduce writing apprehension, (3) the frequency and amount of learner-centered writing about a subject will increase learning of that subject, and (4) concepts students write about will be clearer to them than the concepts they do not write about. The study involved 178 college students and five instructors in the areas of history, psychology, physical sciences, reading theory and practice, and statistics (the latter two being graduate courses). Students were placed into either control or experimental (writing) groups for one semester. Both groups experienced the same, or similar, activities, lectures, discussions, assignments, and tests, with the exception that the writing groups received regular writing assignments designed to fix and reinforce student learning. Students completed pretests and posttests, a writing apprehension inventory, content-area tests, and writing samples. The findings supported the third and fourth, but not the first and second hypotheses. (FL)

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Research on Writing and Learning:

Some Effects of Learning - Centered Writing in Five Subject Areas

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The teaching profession seems largely responsive to the idea of writing across the curriculum (Martin 1976b), but considerable uncertainty exists about why or how to implement it. Teachers outside of English Departments may feel apprehensive about their ability to evaluate the writing of others; they may respond to student writing problems only in terms of surface features of grammatical, lexical, and orthographical correctness; they may feel that their main function is to complain to or about English teachers or to remand poor writers to them for remediation. Those content teachers who deal with writing more self-confidently point to their essay and term paper assignments and their essay tests but are very likely to succumb to the fallacy that assigning and grading writing tasks equates with teaching writing. Over the past decade or so, the weight of evidence has been against these positions (Shaughnessy 1977), but teachers outside the English profession do not follow the field of composition. If they assign writing in their classes, they are likely to use it merely as a form of discipline or a means of testing.

Content teachers may not accept a writing emphasis in their courses because they may see no purpose for doing so other than to improve student writing, which, they argue, is a job for English. Or, if they do accept the idea, they may implement it in ways that compound rather than solve student writing problems. Thus the English profession occasionally argues, with considerable persuasiveness, a motive undoubtedly closer to the concerns of colleagues in other disciplines: that writing improves learning, and that the kind of writing that does so is not necessarily rigorously formal and dreadfully academic.

The research project I am about to describe is part of a broad inquiry into the effects writing tasks have on students: to determine what changes writing causes in the amount and clarity of content learned; what changes in attitudes to writing accompany these changes; what the effect of learning-centered writing is on writing performance; and what kinds of writing tasks are most useful in inducing positive change. Previous discussion of the writing-across-the-curriculum movement tends to be general and philosophical (Nystrand, 1977; Emig, 1977), or descriptive (Writing Across the Curriculum Project Pamphlets, 1973-76; Britton, 1975; Martin, 1976a,b), or hortatory (Emig, 1977; Shaughnessy, 1977). Published empirical data on interdisciplinary writing programs pertain only to faculty attitudes and practices as teachers of writing (Klinger, 1977; Zemelman, 1977; Behrens, 1978), not to their effects on students. The claim that writing improves learning has not been systematically tested or measured, nor have individual strategies of writing-as-learning, especially those most readily applied outside of English class, been extensively assessed.

Yet past research on writing and learning as distinct and separate processes is substantial (Bruner, 1966; Cooper, 1975; Odell, 1974; Smith, 1969), and some of this research evaluates certain intellectual processes in increasing writing effectiveness (Rohman & Wlecke, 1964; Odell, 1973). The psychologists Vygotsky (1962), Luria (1971) and Bruner (1971) indicate that writing is a complex act demanding the use of higher cognitive functions, such as analysis and synthesis (cf. Britton, 1975), and Luria (1971) and Young, Becker, and Pike (1970) make a strong theoretical case for writing as an heuristic and thought-organizing process (cf. Pike, 1964a,b;

Ney, 1971; Fitts and Posner, 1967; Cox, 1933; Piaget, 1952, 1972; Inhelder and Piaget, 1964; Flavell, 1963; Bruner, 1956, 1957, 1962, 1966b, 1968, 1973; Slobin, 1973). In a key article, Janet Emig (1977) contends that both as a process and a product writing possesses a cluster of attributes that correspond uniquely to certain powerful learning strategies. Increased learning may result from writing because writing involves more of the psychomotor (i.e., visual and kinesthetic) processes of the learner, more of the cognitive processes (i.e., memory, translation, interpretation, application, analysis, synthesis, evaluation), and more independence in the organization of thoughts and feelings than other learning modes.

Spoken language as a mode of instruction or strategy for learning has been assessed in a number of studies (Furst, 1967; Hiller, 1969; Rosenshine, 1968; Shutes, 1969), perhaps because speech is regarded as a more comfortable mode of classroom interaction than writing; yet writing actually provides a greater opportunity for student involvement and participation in the learning process. Emig (1977) states that writing is active, engaged, personal, and self-rhythmed in nature--precisely the same attributes according to Polanyi (1958), of successful learning. It follows that if learner involvement of the sort that writing provides is increased, then learning or achievement will also be increased.

Stallings and Kaskovitz (1974) found that learners learn more when they actively participate in the learning process. When writing is used as a means of classroom learning, all learners actively participate by writing. Since the amount of learner participation affects the amount of learning or academic achievement (Dewey, 1938; Bloom, 1974; Boucher, 1974; Ausubel and Robinson, 1969; Adams, 1968, 1971), the difference between listening, which is passive and writing, which is active is important. If writing allows for more independence as well as more participation in the learning

process, it should increase learning. If the learner activity is accompanied by feedback, the amount of learning should increase still further (Lawrence and Goodwin, 1954; Travers, 1973; Bilodeau and Bilodeau, 1961; Smith, 1960; Hilgard and Bower, 1975; Thorndike, 1924; Thelen, 1967; Gagne, 1970). According to a number of recent studies, expecially those by James Britton, Nancy Martin, and others, we may expect these results to be attained primarily through expressive, speculative, knowledge-forming, and value-testing modes of writing (Britton, 1975; Martin, 1976b; Young, 1979). Such writing differs markedly from the finished written product communicative or (transactional) in purpose and steeped in formal academic conventions; it is not evaluated by those conventional standards, is therefore unfamiliar to most teachers, and is likely to seem frivolous to many. Yet it may be said to create an optimal environment for students to use written language frequently and meaningfully for learning (Britton, 1975; Martin, 1967a,b).

The essential purpose of such writing is to answer either or both of two related questions: how well am I learning something, or how well can I express something being learned, or any variation of them. Personal revelation is encouraged, even when the writing responds to specific queries or readings, as is not the case in most college or school writing. We call this kind of writing learner-centered, for want of a better term.

Purpose

The specific purpose of the present study was to investigate certain effects of learning centered subject-related writing on both learning and writing. Four hypotheses supporting the arguments that writing improves learning were tested:

(1) The more that students do such writing in their content courses, the better they will write.

(2) The more that students do such writing, the less apprehensive about writing they will be:

(3) The more and the more often that students do learner-centered writing about a subject, the more they will learn about it.

(4) The concepts students do learner-centered writing about will be clearer to them than the concepts they do not write about.

Measurable gains demonstrating improvement in student writing (Hypothesis 1) and in student learning (Hypotheses 3 and 4) would be powerful evidence in favor of a cross-disciplinary approach to writing. Correlations between gains in writing performance and decreases in writing apprehension would affirm the value of supportive and anxiety-reducing techniques of writing instruction in content courses (Hypothesis 2).

Subjects

The study we conducted, which took place in Spring 1974, included 178 students in 7 intact groups under five college instructors from five different departments at West Chester State College, Pennsylvania: Statistics (graduate-level), History, Psychology, Reading Theory and Practice (graduate level), and Physical Sciences. We started with 21 participants but attrition ran high. The professors in Statistics, History, and Physical Sciences had received a week of preparation in the pedagogy of composition, including training in giving and evaluating writing assignments. The other two professors received minimal preparation, during an hours's interview in which the experiment was explained and a set of descriptive guidelines was reviewed. All of the professors were volunteers. In a 16-week semester, the graduate classes met once a week for three hours and the undergraduate classes met three times a week for 1 hour. Students in the History and Physical Sciences classes were predominantly freshman satisfying general education requirements, while students in Psychology classes were all satisfying

certification requirements for teacher education.

Procedures

Random assignment of subjects to treatment was impractical because of the need to use intact classes of students, so this study therefore conforms to the quasi-experimental nonequivalent control group design (Campbell and Stanley, 1969), and corrects for lack of sampling equivalence by the use of a pretest. The study will be viewed as simultaneous or concurrent replication.

In the original design, the instructors were each to teach one control and one experimental (or Writers) section. However, scheduling problems gave the Physical Science professor a lecture class of 92 students; in a within design, these were randomly assigned to control and experimental groups and then "flip-flopped" in mid-semester.

As nearly as possible, the Writers and Control groups experienced the same or similary activities, lectures, discussions, assignments, and tests, except that the Writers groups were given regular writing assignments designed to fix and reinforce student learning--learner-centered writing--while parallel activity in the Control section consisted of non-written modes of instruction (reading, discussion, lecturing). If formal writing assignments (term papers, essay examinations) were given to the Control groups, they were also given to the Writers groups.

All of the participating experimenters were told that these learning-centered writing assignments could be quite brief, as short as two to three minutes' worth of writing; could be expressive and personal; could be speculative or communicative; could interrupt or close a class or be done out of class; could be preceded or followed by a discussion of their content and/or form; could be kept in a journal; and could consist of draft versions

preparatory to or after a more conventional writing task, for example, as prewriting or revision exercises for an essay quiz. They could be assigned in stages or accompanied by teaching, and any of these variations could be combined.

Professors were offered a variety of reasons why these writing assignments might instigate successful cognitive and affective learning: they focus a student's attention; they are proximate to the ideas to be learned; they are a vehicle for exploring and/or integrating information, values, and ideas; they systematize and record this integration; and they are active, engaged and personal. The correctness of this learning-centered writing was to have no bearing on grades, so students doing it would not be especially apprehensive about being criticized by a teacher for their work, and teachers would not feel obligated to spend time on evaluation and grading. However, instructors were urged to invoke frequently a form of peer review in which students exchanged papers and responded supportively and very briefly to what they read, perhaps only with a check mark or question mark.

For Hypotheses I, II, and III, the amounts of change in writing performance, attitudes about writing, and content learned were measured by post-test scores adjusted for pre-test scores on the same or equivalent test or instrument. For Hypothesis I, a teacher-assigned question requiring 15-20 minutes of writing produced pre- and post-test writing samples, both of which were randomly mixed and submitted to an independent group of trained graduate students for general-impression holistic scoring. The Daly-Miller writing apprehension inventory was used to measure Hypothesis II. A valid and reliable teacher-made and teacher-graded test of content was the basis

for measuring Hypothosis III.

For Hypothesis IV, the perceived clarity of ideas learned by writing was compared with the perceived clarity of ideas learned by other means.

At the end of each class (or other frequent intervals determined in advance by the instructor) each student responded in writing to two questions:

"Which concept dealt with in today's class (or other intervals) is most clear?"

"Which concept dealt with in today's class (or other interval) is least clear?"

Student responses were written on 3 x 5 cards or individual sheets of paper and identified with student names or numbers. The frequency counts for written and not-written concepts most and least clearly understood were analyzed using chi-square.

A total of 43 comparisons were made. Hypothesis I, that students who do learning-centered non-evaluated writing learn to write better, and Hypothesis II, that students who do such writing become less apprehensive about writing, were each tested with three analyses of covariance. Hypothesis III, that students who do learner-centered writing learn more content than students not doing it, was tested using three analyses of covariance and one analysis of variance with repeated measures. Hypothesis IV, that ideas learned using learner-centered writing are perceived as learned more clearly than ideas learned in other ways, was tested with 33 chi-square analyses.

None of the tests for Hypotheses I or II were significant (see Tables I). The differences in one of the four comparisons for Hypothesis III (Table I) were large enough to be statistically significant at the .05 level.

Of the 33 comparisons made for Hypothesis IV (Table IV), twenty-six were significant at or beyond the .01, .001, or .0001 levels; one was significant at the .05 level; five were not large enough to be significant; and one was significant in the wrong direction.

Discussion

Each of the professors conducting the concurrent replications defined the independent variable, learing-centered writing, in somewhat different ways, resulting in a wide variance in the amounts and types of writing assigned to students. Such variance allows the data to indicate which amounts and types of learning-centered writing have more effect on the criterion variables measured. The data show that the greatest effects on writing and learning occurred when more time was spent writing, reading writing, and discussing writing: the more "time on task," the more effect on the criterion variable. Only with the graduate students in Statistics who in each class wrote about at least three and up to five major course concepts, who evaluated each others' writing orally and in writing, and who identified clear and unclear ideas in writing were results significant in amount of content learned. Even here no significance was attained in results for tests of attitudes and skills in writing.

In tests for Hypothesis IV, all three professors actually assigning writing tasks requiring identification of clarity of ideas collected data showing significantly that ideas learned by using writing were perceived as learned more clearly than ideas learned through other means (Table II). If writing had no effect on students' perceptions of the clarity with which they learned ideas, distribution of responses would be even on Table II, with

half of the concepts studied perceived as more clear and half as less clear. In History, undergraduates were used to test a variation of Hypothesis IV in which ideas learned with writing were tested for amounts of clarity of the learning. In this analysis, the difficulty of the idea learned had an effect on the clarity, and the most difficult concept tested was not learned clearly even though students had used writing as part of the learning process.

The experiment will be repeated, with an attempt to hold participating teachers to a more scrupulous definition of learning-centered writing; and it will be varied, with an eye to comparing one kind of learning-centered writing task to another and to other kinds of writing (for example, personal expression compared to practice essay examination questions). Our future studies will include observation and interviews. We hope to find through external funding agencies the incentive necessary for college and other teachers to cooperate rigorously in this kind of research, in both its quantitative and qualitative aspects. Research into the value of writing as a means of learning is, we believe, considerably important to the teaching profession, especially so to teachers concerned with literacy, and that should mean all teachers, not just those in English or language arts. Significant findings would do much to support more and better writing programs in which we teachers of English share responsibity with our colleagues down the hall.

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TABLE I SUMMARY TABLE FOR ANALYSIS OF COVARIANCE FOR PRETEST, POSTTEST, AND ADJUSTED POSTTEST MEANS AND REPEATED MEASURES ANALYSIS OF VARIANCE ON ONE COMPARISON

Criterion	Subject	Factor level	Pretest mean	Posttest mean	Adjusted posttest mean	F
Writing skill (Hypothesis 1)	Statistics (N=8)	Experimental	3.17	3.67	3.60	.61 (NS)
		Control	4.00	4.33	4.46	
	Psychology (N=31)	Experimental	5.21	5.36	5.21	.26 (NS)
		Control	4.17	5.44	5.56	
	Physical Science (split group) (N=61)	Experimental	5.67	4.87	4.76	.13 (NS)
		Control	5.22	4.53	4.64	
Writing Apprehension (Hypothesis 2)	Statistics (N=20)	Experimental	80.79	83.57	85.76	.09 (NS)
		Control	91.14	91.86	87.48	
	Psychology (N=37)	Experimental	92.21	92.63	90.12	1.30 (NS)
		Control	86.95	91.58	94.09	
	Reading (N=13)	Experimental	80.00	84.13	88.09	.35 (NS)
		Control	91.17	90.50	85.21	
Content learning (Hypothesis 3)	Statistics (N=25)	Experimental	53.13	98.31	99.22	4.82
		Control	57.70	93.10	91.65	
	Psychology (N=43)	Experimental	13.65	57.95	57.77	.53 (NS)
		Control	13.42	55.83	55.98	
	Reading (N=18)	Experimental	16.00	82.22	83.66	1.20 (NS)
		Control	17.70	80.20	78.90	
	Physical Science (split group)* (N=92)	Experimental		71.80		.75 (NS)
		Control		69.04		

*Repeated measures analysis of variance

TABLE II CONTINGENCY TABLES FOR IDEAS WRITTEN AND NOT WRITTEN BY AMOUNTS OF CLARITY OF LEARNING

		Written ideas	Not written ideas
Comparisons for Graduate students in Statistics			
	Most clear	127(83)	10(54)
	Least clear	39(83)	98(54)
	$\chi^2 = 118.35$	$p < .0001$ total for semester	
Comparisons for Graduate Students in Reading			
	Most clear	78(50.49)	24(51.51)
	Least clear	21(48.51)	77(49.49)
	$\chi^2 = 60.57$	$p < .0001$	

CONTINGENCY TABLE FOR AMOUNTS OF CLARITY OF LEARNING USING WRITING AS A MEANS FOR LEARNING

		Written ideas
Comparisons for Undergraduate students in History		
	Clear	52(49)
	Not clear	46(49)
	$\chi^2 = .38$	$p < .70$

df 1
Expected values are in parentheses

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